The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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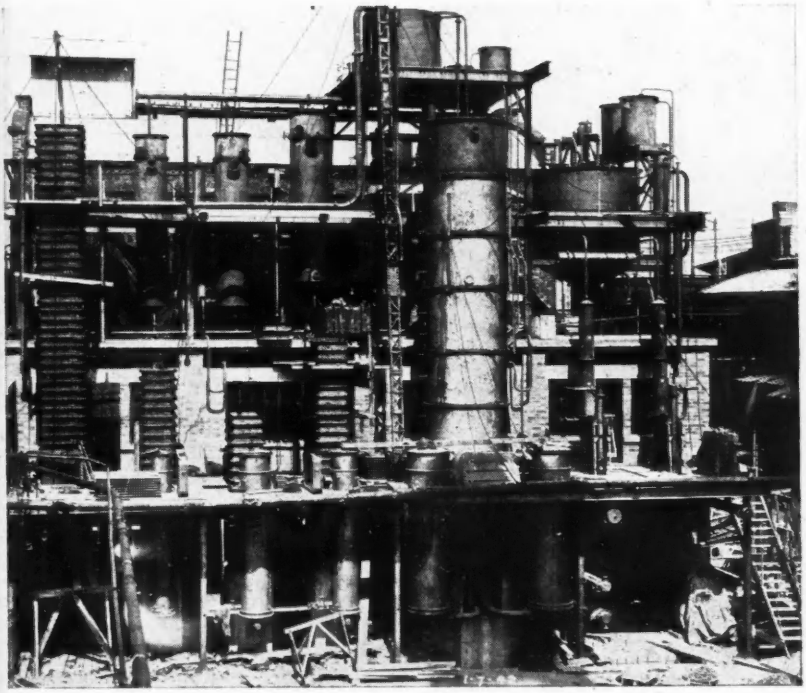

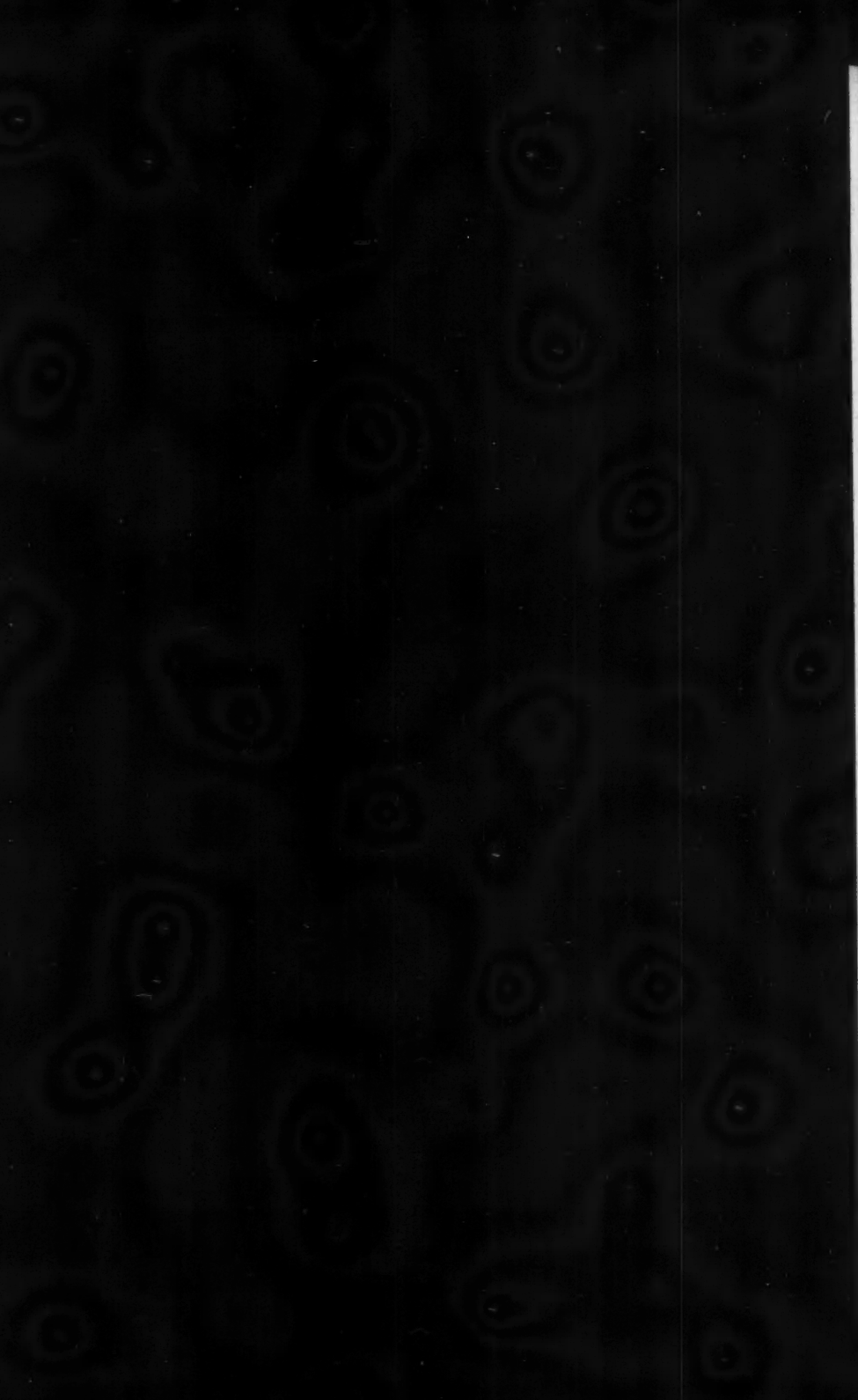

Safety First

This page is a monthly feature devoted to announcements in the interests of safety in Works and Laboratories.

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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The Utilisation of Metals

THE chemical industry is closely connected with metallurgy. The processes of chemistry are required to obtain metals from their ores and important chemicals often result as by-products from smelting operations. The operation of manufacturing commercial grades of metal from the crude materials is purely metallurgical, but after the metals have been so prepared the chemical engineer makes use of them in the construction of his plant. It is not surprising, therefore, to find that some of the largest manufacturers of steel and alloy steels are members of the British Chemical Plant Manufacturers' Association, while the metallurgical policy of the country becomes of necessity a matter of importance to the chemical industry.

Articles have appeared in the daily Press suggesting that the Germans are hard pressed for steel, partly because of the effect of bombing on the industries of the Ruhr and partly by reason of the shortage of alloying elements. It is probably true that there is, in fact, a down-grading in the use of steels, so that German engineers have to be content to use steels for purposes for which they have hitherto been told they were not the best possible. Considering the immense requirements of mechanised warfare, it is not surprising that some difficulties exist in making the available steel cover the necessary requirements. But if a certain stretching of supplies is necessary in Germany the truth is that it is equally necessary in this country, in the U.S.A., and in Russia.

It has been suggested that the R.A.F. raids have reduced German production by 1¼ million tons a year, and that in consequence basic Bessemer steel is now being used more frequently in Germany, although it is of inferior quality and reliability. Still, since the available output of steel from the Axis and Axis-controlled countries is well over 40 million tons, a reduction of 1¼ million tons is far from being disastrous. It is also a fact that fundamentally the basic Bessemer process produces reliable steel if control is satisfactory. The Germans in particular have brought this process to a high degree of efficiency, and suitable control appliances have been vastly improved in recent years. There is no ground for supposing that there is any shortage of steel in Germany other than that which affects all nations of the war in their desire to produce more munitions in order to strengthen their

On Other Pages

armed forces. Moreover, the raw material position in Germany is, if anything, better than ours and we must face the situation that we have to work out our own salvation.

The Allied steel position, in short, gives rise to considerable anxiety. We, too, have limited facilities for production. It is true that we now produce virtually all our ore in this country and the combined production of ore and disposal of scrap is maintaining the output of our steel plants. This is entirely due to the good work of industrialists who were appointed by the Government for that purpose. The sources of the principal alloying elements used in the steel industry are widely scattered throughout the world; no steel-making country possesses complete essential resources and all must import much that is necessary. Manganese ore, though distributed far and wide, is produced essentially in Russia, India, West and South Africa, Brazil, and Germany. Nickel ore production is focussed on localised deposits in Canada. Chrome ore, though located in many other places, is produced in Rhodesia and South Africa, Turkey, and the U.S.S.R., and to a lesser degree in Cuba, the Philippines, India, Yugoslavia, and Greece. Tungsten ore is mainly produced in China and Burma, and to a smaller extent in the U.S.A. and South America. Molybdenum ore production is concentrated essentially on deposits in the U.S.A. Vanadium ore is produced mainly in Rhodesia and South-West Africa, the U.S.A., and Peru. Cobalt ore is derived principally from the Belgian Congo, Rhodesia, French Morocco, Canada, and Burma. It will be thus seen that the principal steel producing countries—U.S.A., U.S.S.R., Germany, Great Britain, France, Japan, Belgium, Luxembourg, and Scandinavia—are dependent on the normal functioning of international trade and copious transport, particularly in the form of shipping. This has been pointed out by Dr. Hatfield in a paper to the British Association with the additional information that Great Britain relies, in normal times, on importing 30 per cent. of her iron ore and the whole of her manganese, chrome, nickel, tungsten, molybdenum, vanadium, and cobalt. Germany counts on importing most of her manganese ore and the whole of her chrome, nickel, tungsten, and molybdenum; she claims to recover her vanadium at home. The U.S.A. imports over 90 per cent. of her manganese ore, practically all her chromium, nickel, and cobalt, and a substantial proportion of her requirements in tungsten.

One of the greatest technical achievements is the colossal output of iron, and by virtue of the influence that carbon and other elements can readily confer upon it, a wide range of properties is available. It can be converted by added elements into any of a wide range of tool steels and steels for many special applications. These results are attained by a knowledgable heat treatment superimposed on a selected composition.

It is obvious that the overrunning of certain countries by the Axis has given them supplies of certain alloying elements which were formerly available to the whole world. It is, therefore, necessary for the Allies, as well as Germany, to make use of steels for purposes to which they are not normally applied. It is only in times of war that substitutes which have made little headway under normal conditions may be used for materials more difficult to obtain without any sacrifice in effectiveness and sometimes with a positive increase in efficiency. Moreover, as the life of many of the machines produced for war purposes is likely to be short judged by normal commercial standards, an inferior quality of material is frequently justified on the ground that it will do its work, though it will not last so long.

Producer and user must now co-operate to use materials which are sufficiently effective for their purposes, and which are also most readily available. Our present problem—a considerable one—is how at the present time to cater for a greatly increasing demand for steels of the necessary properties with a changing availability and a considerable deficiency in some of the essential elements. A most interesting technical situation has developed, requiring keen scientific work for its solution. Within the steel industry there has been friendly and enthusiastic collaboration. This collaboration must extend to the purchasers of steel and alloys, and manufacturers of plant must be satisfied with different standards, and in some instances with lower qualities of material, than they would normally accept.

NOTES AND COMMENTS

Specifications for Steel

OUR leading article on the subject of steel and design reminds us of the valuable work of the Technical Advisory Committee of the Special and Alloy Steels Committee. This body was set up in May, 1940, to deal with the problems ventilated in our leading articles. The 2000-3000 specifications by which steel was then governed were sorted out into 85 categories on the basis of mechanical properties, compositions, or special functions, so that it became possible to measure up needs against availability as regards the essential alloying elements. A survey of the categories of the schedule has made it possible to answer such questions as these: How far can results be achieved without alloy additions? How far can nickel and chromium be used to replace one another? In what circumstances are molybdenum and vanadium essential? Can tungsten and molybdenum be used to replace one another? Can given characteristics formerly obtained by alloying elements be secured by heat treatment?

The "En" Steels

IN 1941 advantage was taken of the existence of the British Standards Institution to issue BS. 970/1941, a document, giving, in the form of 58 specifications, the principal and most useful of the steels in the schedule covering wrought carbon and alloy steels for general engineering purposes in dimensions up to 6 in. ruling section. This was shortly followed by BS. 971, which supplemented the contents of BS. 970 with much technical and other useful data facilitating the successful application of the selected steels; this document sets a precedent in form. At this stage the Steel Controller issued a direction through BS. 970A, indicating that, in conformity with existing conditions, certain steels specified in BS. 970 should, in the absence of special sanctions, be the steels applied in future programmes. Thus the "En" series of war steels entered upon their useful career. On March 30, 1942, a brochure was issued indexing and correlating the great mass of specifications to the steels of the Direction 970A which sought to replace them. Two remaining steps should be mentioned: BS. 970/1941 was revised and is re-issued as BS. 970/1942, and representatives of all the services, after deliberating the steps already taken, issued through the British Standards Institution, document BS/STA. 5, which coordinates the whole of the requirements of the services within the terms of reference with the composition and properties of the steels of the direction on the basis of the "En" series contained in BS. 970/1942.

Government Control of Industry

THE assumption of complete control by the Government of a colliery is something of an event. But this is in fact what occurred on November 4, when, by an Order of the Ministry of Fuel, under defence regulations, control was assumed over the Nottingham and Clifton Colliery Co., Ltd., which worked the Clifton Pit near Nottingham and employed nearly 500 men. Press reports state that the pit has not been as productive as it might have been if machinery had been introduced. The alleged cause of this, lack of capital, will, it seems likely, cease to operate now that the pit is under Government control. Revolutionary though this move may seem, it is no more than a step in the logical progression towards full efficiency in war production; it follows the expropriation of "Class C" farmers by the Ministry of Agriculture. No one will deny that the products of both farm and colliery are munitions of war, and it is the Government's business to see that the production of munitions is not delayed by inefficiency, no matter what the reason. Such chemical works as we have been privileged to visit since the war appeared to be functioning at least reasonably efficiently; but it will do no harm for manufacturers in all vital trades to realise that they are under observation, and that if they cannot control their business properly, there is no reason on earth, in war time, why authority should not step in and control it for them.

Wholesale Prices in October

ONCE again the monthly wholesale price index figures published by the Board of Trade show no change in the iron and steel and the non-ferrous metal

groups. Taking 1930 as 100, iron and steel remain at 182.7 and non-ferrous metals at 126.0, having shown no change since April and June respectively. By contrast, the figure for chemicals and oils shows a rise of 3.2 per cent., from 137.2 to 141.5, the largest increase for the month in the "Industrial Materials and Manufactures" group. Since October, 1941, when the index figure stood at 128.5, the rise has amounted to 10.2 per cent. The rise during the month has been due to the increased prices for palm kernel oil and groundnut oil, and soap, and there was also a small rise in the price of paint in early October. In the last week of the month the price of imported potassium nitrate advanced by 13 per cent., but this commodity has a weight in the index of only one-tenth of a unit.

Oil from Coal Complaint

THE main argument in Dr. G. E. Foxwell's paper on "The Provision of Smokeless Fuel for Post-War Reconstruction," presented to members of the Institute of Fuel in London on November 12 (reported in last week's CHEMICAL AGE) received a larger degree of general approval than the author may have expected. The discussion which followed it brought out, in the main, disagreement with subsidiary points where it did not indicate whole-hearted support. Mr. C. A. Carlow, who has coal interests in Scotland, was among the chief dissenters. He objected to "dictation from the Ministry of Fuel as to what fuel we use." He revealed that the coal industry had "the greatest scientists" engaged on the problem of finding more efficient appliances for the burning of solid fuel. His concern produced by-products such as motor spirits and oil. "The Government," he said, "prefer to import their motor fuel rather than support that produced in this country." He indicated that his industry was ready to do much more in this direction if given the opportunity.

Welding or Riveting ?

AMONG the important issues in the shipbuilding industry, where tremendous efforts are now resulting in a production level which more than makes good losses, is the question of whether welding or riveting is to be preferred. In an interview given to the *Journal of Commerce and Shipping Telegraph*, Sir Leighton Seager, shipowner and underwriter, speaks of the *Ocean Vanguard* the first of the welded ships built in the United States to the order of the British Government. "The smooth hull certainly provides less resistance and is a favourable feature," he said. "My own view is that the welded hull is as strong as, if not stronger than the riveted hull." He thought that a welded joint properly made was practically the same strength as solid plate. The other side of the question presented itself when it came to the question of repairs. These could be carried out effectively on welded vessels in the United Kingdom, but at the present time not as expeditiously as in America. Repairs to bottom plating were more difficult owing to "overhead" welding, and the great size of plates in the American ships was a feature to which we had not yet become accustomed. It has now been announced that Lloyd's Register has brought from America two members of the Society's American staff who have had much technical experience in the work; and they are to be lent to the Admiralty.

The Passing of a Paladin

THE literature of the war has just been enriched by a beautiful tribute to a young British officer who gave his life for his country while flying over the Libyan desert. The officer whose faith and ideals are enshrined in this memoir was Captain Christopher Benn, Sir Ernest Benn's youngest son, who, after serving in the ranks at a searchlight station in Suffolk, obtained a commission and was posted to the War Office where he continually pressed for the chance of service in the field eventually granted to him in Egypt. His eldest brother, Captain John Benn, is the author, and Christopher's exalted view of life and service appears superbly in the title "I Say Rejoice" (Faber & Faber, 6s.). Christopher Benn was a serious and realistic thinker who never shared the shallow illusions about permanent peace and disarmament which were unhappily rife in his generation. He flung his mind as well as his body into the war like a paladin of old, and no more moving war letters have been written than those in which he proclaimed the ideals of a sensitive, cultivated, courageous young Englishman. Nobody can read this volume without feeling uplifted by a tender portrait of a heroic soul.

Tantalum in Chemical Industry

Resistance to Chemical Action : Valuable Physical Properties

by H. SEYMOUR

THE outstanding chemical property of tantalum is its unusual resistance to chemical corrosion, for it is not attacked by hydrochloric or nitric acid, and is not even affected by aqua regia, the only acid that will dissolve gold and platinum. It may, in fact, be termed a "noble" metal. It is not attacked by dilute sulphuric acid at ordinary, or even high temperatures, though it does appear to be slowly attacked by boiling concentrated sulphuric. Solutions of caustic alkalies do not affect it easily, and neither solutions of chlorine, nor chlorine gas itself, have any effect on it. Hydrofluoric acid appears to be the only chemical agent that will attack tantalum, and even its action is very slow when both metal and acid are very pure. A mixture of hydrofluoric and nitric acid, however, will attack tantalum rapidly, causing it to go into solution as tantalum fluoride. If tantalum is heated in air, its surface becomes blue at a temperature of about 400° C., and nearly black at a somewhat higher temperature. At still higher temperatures, the white oxide is produced as the metal gradually burns.

Fine Cutting Edge Obtainable

The same property that makes tantalum hard and brittle when heated in the atmosphere enables the metal to hold a fine cutting edge if the tempering process is accurately controlled. Tantalum, thus carefully tempered, makes excellent dental tools, for it holds a fine cutting point or edge, yet is sufficiently resilient to minimise the danger of breakage. Moreover, it is unattacked by iodine, acid, or moisture and may even be sterilised in a flame without affecting its hardness. Even if the point should be broken, there is no danger of injurious irritation or poisoning in consequence of chemical changes within the metal.

The physical characteristics of tantalum are as unusual as its chemical properties. In the state of purity to which it is commercially refined (99.8 per cent.), the metal is steel-blue in colour when unpolished, and white, almost like platinum, when polished. Tantalum is characterised by toughness, malleability, and great ductility. It is worked cold with ease and may be put through the various mechanical operations usually applied to common metals; hammering, rolling, drawing, punching, sawing, machining, etc. Ordinary hard-worked tantalum wire and sheet will stand a considerable amount of forming. It may be made into tubes $\frac{1}{4}$ in. in diameter, and as wire it may be coiled about a mandrel of its own diameter. Under ordinary conditions tantalum has approximately the stiffness of cold rolled steel. In commerce it is frequently rolled from 0.3 in. down to 0.015 in. without intermediate annealing. Annealed tantalum is very soft and has an elongation under tension of from 10 to 20 per cent. It has been drawn into capsules 3/16 in. in diameter, and $1\frac{1}{2}$ in. long and into small tubes such as are used in hypodermic needles. It cannot be worked hot, nor can it be soldered, but it welds readily to itself and to other metals by the roller or electric spot welding processes. The metal welds particularly well to nickel, and the percussion method of welding is well adapted to tantalum.

Tantalum is to-day permanently coloured by means of a simple electrolytic process which is easily controlled so as to produce at any point on the metal shell any design and any desired colour or combination of colours. For this reason it is being utilised for watch-cases and is fashioned into small jewellery.

Occlusion of Gases

Another property of tantalum which makes it valuable as a lamp filament material is its occlusion of gases. At high temperatures this metal absorbs those gases or gaseous oxides which often remain in a valve after evacuation, thereby enhancing the efficiency of the tube and prolonging its life. Tantalum also absorbs any gases which may be given off by the other metals in the bulb. Gas-filled valves of any character present a fertile field for new applications of this metal. It has been successfully used as

electrode material in such tubes as those of the neon sign. Used in this way, tantalum tends to preserve the original pressure of the gas in the valves, thus prolonging their life. In certain types of vacuum valve, it is sometimes desirable to introduce very small, measured amounts of certain pure gases. Tantalum affords a simple method for doing this. If a piece of tantalum is heated to a dull red in the presence of any pure gas, it will absorb that gas until an equilibrium is reached. Tantalum will hold the gas thus absorbed until it is driven out at a higher temperature. Where the tantalum is so placed in the valve that it may be heated, the gas can be liberated and re-absorbed at will. Where low pressures of pure gas are required in amplifier or power tubes, this presents an ideal method.

Laboratory Equipment

Wherever support wires are anchored in glass of any kind, tantalum wire is to be preferred. It holds firmly to the glass, never cracks it, remains firm and strong, and does not trap air bubbles. The metal is slightly stiffened at its junction with the glass, but is left pliable and ductile throughout the remainder of its length. Unlike nickel, it does not burn or weaken, nor will it pull out or loosen in service. Tantalum is finding wide use in chemical laboratory equipment where glass, porcelain, and platinum have long held sway. Tantalum dishes, spatulas, stirring rods, filter cones, and analytical weights are coming into common use. While tantalum does not possess the same chemical inertness to oxygen as platinum, it is entirely unaffected by oxygen at any temperature up to 600° C. And this slight disadvantage is more than balanced by the fact that tantalum is unaffected by aqua regia, which dissolves platinum. Laboratory dishes of tantalum are readily cleaned in any acid except hydrofluoric. Tantalum dishes are harder, stronger, and more durable than those of platinum, and may be had at less cost.

For the lining of certain large-scale chemical equipment of simple design, tantalum presents an attractive possibility. There are probably many such applications where tantalum could be used with economy. However, such applications to large or complicated equipment cannot be generally recommended, owing to problems in fabrication and cost. In many respects, it is more suitable than any other metal for the cathodes used in electro-chemical analysis. For example, zinc may be plated on tantalum since it does not alloy with it. Gold or platinum can be deposited on tantalum, then removed with aqua regia without injury to the electrode. In the same way, any other metallic deposit on tantalum may be removed chemically, therefore an electrode made of it should last for many years.

There is no good reason why tantalum should not also be used for the pans, knife-edges, and other parts of scales, for these, as well as the weights, are subject to corrosion, either from fume-laden atmospheres, or by direct contact with chemicals. Pharmaceutical scales, on the accuracy of which physicians' prescriptions largely depend for their efficiency, should also be constructed of a material which cannot be contaminated by drugs or chemicals. The prescription room of a dispensary should certainly be as well supplied with corrosion-resisting equipment as is a technical laboratory, for human life often depends on the efficiency of pharmaceutical dispensing service.

It is frequently desirable to have instruments for recording time, temperature, pressure, etc., in places where dampness and chemical fumes make the life of the average precision instrument short. An instrument made with tantalum parts, or made of other metals and sealed in a tantalum case, would last indefinitely even under extremely adverse conditions. In fact, thermometers mounted on tantalum bases could be actually thrust into boiling acids without injury to the thermometer or danger of contaminating the acid. Such a thermometer-base could easily be stamped and engraved much as brass bases are.

Artificial Silk Manufacture

Tantalum has found extensive use in the manufacture of artificial silk, thanks to the metal's acid-resisting qualities. In the viscose process the structure of the fibre is determined by the size and shape of the tiny holes in the spinnerets: the latter must in consequence be made of a metal that will not wear away under the corrosive action of acid. Until tantalum

was tried, spinnerets had to be made of platinum, or an alloy of platinum and gold. But tantalum spinnerets, far lower in cost, were found to be more durable and easier to make, and have rapidly come into general use.

Tantalum suggests itself for use in small tools, made either entirely of this metal, or tipped with it. Such tools would be rust-proof and non-magnetic, and could be hardened as successfully as steel. On soldering machines small parts which are exposed to acids used as a flux could be made economically from tantalum. Tantalum also recommends itself as a metal for optical and photographic apparatus. For camera shutters and lens mountings, a metal with a dead black non-reflecting surface is required. Brass has usually answered this purpose, but it is frequently necessary to produce non-reflecting surfaces on delicate moving parts, also. Travellers who have carried cameras and binoculars on long sea voyages, or in tropical areas, know the hopelessness of trying to keep such equipment free from trouble due to dampness and corrosion Tantalum, being easily blackened by heating in air and totally unaffected by atmospheric conditions of any sort, can be used to advantage in optical goods of this type. Tantalum for writing nibs is established. Not affected by ink, strong as steel, and possessing an elasticity equal to it, tantalum pen-points have the smoothness of gold pens at a fraction of their cost. The point of a tantalum pen can be hardened by heating it for a moment in air, whereas with gold pens, a point of iridium must be welded to the gold in order to attain sufficient hardness for satisfactory service.

NEW "GAP" GLUES FOR AIRCRAFT

Synthetic glues are being used in the aircraft industry with good effect, although it has been found that their application entails careful technique, with strict control of mixing and the period of use The glues, when set, are impervious to changes in temperature and are unaffected by water. Recently the various firms producing such glues have evolved "gap" glues, for which it is claimed that an effective joint has been obtained even when a slight gap—up to about 0.020 in.—has been left between the two surfaces to be joined

Research Conference

"Failures" in the Laboratory

DR. H. A. SKINNER, presiding at a chemists' conference arranged by the Association of Scientific Workers in London last Sunday, said that in industry research work is considered the domain of young chemists. "Above thirty-five, if still in a research laboratory, a chemist is a 'failure.' This has the effect of prostituting research, since the ambitious worker is led to regard it merely as a 'training school'."

Among other speakers, Dr. E. A. Rudge, head of the Chemistry Department at West Ham Technical College, spoke of the "very unsatisfactory state of technical education due to the fatal complacency of the last twenty years." He was alarmed at the lack of coupling between industry and schools. Headmasters, when asked to provide recruits for industry, sent along the duller students. Dr. A. E. Dunstan, chief chemist of the Anglo-Iranian Oil Company, said that, compared with other industries, coal was still in the Middle Ages. Coal people just sold coal. The petroleum industry sold not only petrol and lubricating oils, but could provide the raw materials for synthetic rubber and plastics. Coal should be an equal source of such things.

Factory Accident at Widnes

A Fine Safety Record Upset

LAST week at Widnes Police Court, Messrs. Orr's Zinc White, Ltd., were fined £20 and 5s. costs for having contravened the Factory Acts by not having machinery securely fenced. Mr. S. J. Evans, for the Ministry of Labour, explained that the company had provided steel sheets to be placed over a worm conveyor to prevent anyone from coming into contact with it. On September 24 last a fitter was instructed to carry out repairs to the middle one of three conveyors, and was told that the motor driving the conveyors was fused. The protecting sheets were off and he balanced himself to do the work by placing his foot on one of the side conveyors. The conveyor suddenly started, his trouser-leg was caught, and his leg was drawn into the worm, and later had to be amputated.

Mr. T. Swale, for the company, did not dispute the facts. This was the first occasion during their long period of operation in Widnes that they had been summoned for a breach of the Factory Acts. In this unfortunate instance a train of circumstances was set in motion because the man who controlled the motors driving the conveyors had been called away for a medical examination. Steps had since been taken so that the covering sheets would not only be bolted, but also hinged.

Parliamentary Topics

Alcohol Distillation Plants

WHEN, in the House of Commons last week, Dr. Little asked the Minister of Production whether the Government would follow the lead of the U.S.A. and Canada by taking over whisky-making plants in this country for the manufacture of alcohol for military purposes, he was informed in reply by Mr. Garro Jones that the U.S. and Canada had ample material and capacity for the manufacture of alcohol, and that as a considerable saving of shipping was effected by importing industrial alcohol instead of the raw material required to make it here, the amount of distilling in this country had been reduced and most distilleries, including those normally used for whisky, were now out of use, or used for storage.

Scrap Iron

Mr. Broad asked the Minister of Supply what price was being charged by his Department for scrap wrought-iron supplied to iron and steel works. Mr. Peat replied that all scrap iron collected by the Minister of Works was transferred without charge to the Ministry of Supply, who arranged for its disposal. Any sales of scrap by the Ministry of Supply direct to consuming works were made on the Ministry's behalf by the British Iron and Steel Corporation (Scrap), Ltd., a non-profit-making company under the direction of the Iron and Steel Control. The prices charged were within the maximum set out in the Second Schedule to the Control of Iron and Steel (No. 14) (Scrap) Order, 1940.

Industrial Research

F.B.I. Plan

AT a meeting of the executive committee of the Federation of British Industries under the chairmanship of the President, Lord Dudley Gordon, the significant part that industrial research must play in the post-war world was discussed. It was decided to set up a committee to survey the problem and to recommend all possible steps for the encouragement and co-ordination of research. It was realised by the Federation, when it published its Report on Reconstruction, that the attempt to define post-war problems to be faced by industry must be followed by further detailed study. To that end, three committees have been set up: (1) The Organisation of Industry Committee, under the chairmanship of Sir Charles Bruce-Gardner, to collect evidence from 180 trade associations representing organised industry; (2) the Transport Reconstruction Committee, under the chairmanship of Mr. J. J. Hughes; and (3) a committee to discuss with representatives of the United States' organised industry their reactions, which are expected shortly, to the Report on Reconstruction.

With regard to scientific research it is pointed out that, although many firms possess first-class research organisations, and although there are 21 industrial research associations formed on a national basis, further steps are needed to impress on industry as a whole the need for research and to encourage all industries to reach the high standards achieved by some. Industrial research is carried out either by the individual firm or by the individual industry acting through some form of research organisation. At the same time, it is felt that the Federation, in consultation with such bodies as the D.S.I.R., might play a useful rôle by: (1) Surveying the existing research activities of industry. It is understood that the Government are already considering this matter, and it is suggested that co-operation between the Federation and the Government in the study of the problem might be mutually beneficial. (2) Publicising the importance of research and the practical benefits to be derived from it. (3) Helping industries or firms which have not previously undertaken research work to make contact either with suitable institutions or with other firms whose experience might be valuable to them in forming their plans. (4) Studying the education of research workers and their recruitment into industry.

British Fuel Resources

Development of Oil from Waste Coal

A SUGGESTION that after the war a shortage of oil would compel Great Britain to develop her own fuel resources to the full was made by Mr. J. Arthur Greene, a fuel expert, now living at Heighington (Co. Durham) in an interview with a correspondent of THE CHEMICAL AGE. Mr. Greene said that we should be forced to give serious thought to the extraction of oil from coal and the use of sewer-gas and other "waste" forms of gas. The extraction of oil from coal would bring a new era of prosperity to Durham; gas could be drawn off the closed collieries in the south-western part of the county. Mr. Greene said that often the poorer qualities of coal which had hitherto been wasted were the richer in by-products. He added that the American Government was inquiring into the use of the vast oil shale deposits of Colorado. It was a remarkable state of affairs, he concluded, that America, which produced 60 per cent. of the world's petroleum, should consider it necessary to prepare for the future, while Britain, which had no natural petroleum, had shown little interest in the development of deposits which it was known would yield fuel-oil and paraffin.

Drawn Glass*

Modern Production Methods in a New Canadian Industry

OF the many new chemical and process industries operating in Canada as a result of the war, none is of greater interest than the drawn glass plant of Industrial Glass Works Co., Ltd., at St. Laurent, Quebec. This is another outstanding instance of how Canada has benefited technically and industrially from the skill and knowledge of men who have been driven from Europe by the war. When Germany invaded Belgium, men skilled in window-glass production escaped to Canada to start the enterprise which is now in operation with an annual capacity equal to more than half the window-glass consumption of the Dominion.

Glass Drawing Processes

The method used by Industrial Glass Works Co., Ltd., for the production of drawn glass is one of two mechanical systems in very general application to-day in the glass industry in both Europe and America. The first of these processes was based upon the hand-blown cylinder, and was the principal method for production of window-glass up until about 1903. The glass-blower gathered on a hollow pipe a glass ball which was then elongated slightly by blowing. More glass was gathered until the mass weighed 40-50 lb. The molten glass was then elongated by further blowing, combined with a swinging motion in a pit near the furnace, until a cylinder of considerable size was produced. The cylinder was then cut into sections which were heated and flattened into sheets of window-glass. The first important mechanical development in window-glass production was the invention of equipment for the production of machine-blown cylinders. Molten glass was placed in a pot, and a pipe or tube having a mushroom-shaped cap was lowered into the glass. The tube was then slowly raised while compressed air was blown in until a cylinder about 50 feet long was formed. This large cylinder was lowered mechanically, cut into sections, and the sections split lengthwise by red-hot wire. The glass was then flattened out in the flattening oven where it was heated to a softening temperature and ironed with wooden shoes. Annealing and packing followed.

While drawn glass is produced in huge quantities and does not have to measure up to the fixed requirements of, say, an optical glass, it is true that a high degree of purity is needed in raw materials in order to secure good output of a uniform and acceptable product. Raw materials must be of such a character that on melting they will produce uniform glass with such properties that it may be drawn into a sheet of even thickness without undue difficulties from breakage.

Silica sand of high purity constitutes a large part of the mixing batch in the production of window-glass. In order to secure good colour in window-glass it is necessary for the iron content of the sand, as well as of all other materials, to be quite low. While the silica sand may contain other impurities that are not detrimental to certain classes of glass, the manufacturer commonly uses a sand of maximum silica content and uniform purity. Broken or waste glass, known as "cullet," which hastens the melting of materials and shortens the time for the batch, accounts for another 40 per cent. of the mix. Soda ash facilitates the combining and melting of the ingredients and salt cake is added to lower the melting point and viscosity of the liquid glass. Limestone increases the hardness without colouring the glass and contributes to stability and permanence. However, the proportion of limestone must be carefully controlled since excessive amounts increase the tendency of the glass to vitrify.

Crystallisation

In connection with the use of calcium carbonate, it should be noted that crystallisation is one of the difficulties sometimes encountered in the Fourcault glass-drawing process. A fairly general approach to the problem of crystallisation in Europe was the addition of small amounts of alumina and the substitution of about 2 per cent. of soda for an equal amount of calcium oxide in the glass. In North America, an alternative solution was the same substitution of sodium for calcium with the use of some magnesia in place of additional alumina. The various raw materials for the mixing batch are carefully weighed out, pulverised where necessary, and transported to mixers in which revolving paddles thoroughly mix the ingredients. The mixed batch is elevated to a storage bin on the charging floor of the furnace, and is then run into containers which operate on an overhead rail. A load of the mix is charged into the furnace at regular intervals to keep the level of molten glass in the melting section of the furnace fairly even. The rate of charging depends upon the rate at which glass is being drawn from the far end of the furnace.

The great rectangular furnace equipped with regenerators is fired by a number of

* *Canadian Chemistry and Process Industries*, September, 1942, p. 517

oil burners. The temperature is recorded at various points in the furnace and the burners regulated to give the proper operating temperature in each section of the huge tank. Refractories are of great importance in the operation of this type of furnace, since it may be required to undergo long periods of continuous operation and, in fact, it is a necessity that it should do so for any semblance of operating economy. Then, too, the rather exact conditions required for efficient drawing operations can only be achieved through continuous operation. The furnace consists of three compartments: the melting tank with a capacity of 500 tons of glass where the fusion of the batch takes place; the refining section in which impurities in the molten glass are removed; and the working compartment or drawing tank in which the glass is maintained at a proper and uniform temperature for the drawing process. The melting tank is operated at a temperature of about 1460° C., with slightly higher temperatures maintained in the refining section of the furnace.

Fourcault Drawing Process

In the Fourcault vertical drawing process, as employed at this Canadian plant, the molten glass is drawn upwards between asbestos-covered rollers. A slotted block of refractory material is floated on the surface of the glass in the drawing tank. When pressure is applied, partially submerging the refractory block, molten glass flows upward through the block. In starting the drawing operation, a row of nails in the bottom of a metal sheet is brought into contact with the molten glass welling through the block, and the bait—as this metal contrivance is termed—is drawn upwards through the rollers, thus starting the glass sheet on its way. The asbestos-covered steel rollers supply the drawing and lifting power for the glass sheet which is drawn up two storeys above the level of the drawing tank of the furnace. The rollers, with the exception of four upper pairs, are enclosed in a box-like structure of steel plate which serves to retain the heat given off by the glass and thus serves as an annealing lehr. As the glass proceeds up through the rollers, it slowly cools and hardens, and when it emerges from the top set of rollers it can be handled readily by men using protective gloves. A man working in a pit, below the level of the floor on to which the glass is removed from the drawing rollers, cuts sheets from the continuous strip to the size desired for handling.

Factors which determine the thickness of glass drawn by the Fourcault process include the rate of drawing, the hardness of the glass as affected by temperature, the immersion depth of the drawing block. By lowering the drawing temperature to give a harder blast, a higher-speed draw may be employed while maintaining the same thickness of finished product; but if the temperature is lowered too far, vitrification threatens. The annealing requirements of the glass vary with thickness, and in this process it may not always be possible to secure the ideal, but results obtained are satisfactory for practical purposes. A higher drawing temperature tends to improve the quality of the glass but is not always so advantageous from the point of view of annealing.

Multiple Equipment

A number of sets of drawing rollers may be operated from one melting furnace, provided the drawing tank designed is suitable for multiple operations and that the melting capacity of the furnace is large enough to supply the amount of glass required. At the St. Laurent plant three sets of drawing equipment are being operated from the one furnace. Of course, each set of rollers can be operated or not as desired, thus offering a fairly wide range in output.

The Fourcault process, in common with other mechanical drawing processes, shows very considerable savings over the old cylinder process. Less labour is required, few skilled technicians are needed, and the elimination of flattening and cooling furnaces is an important economy.

The sheets of glass, on removal from the top of the drawing roll, are loaded on to trucks and taken to the large storage and cutting floor of the plant. Here the large sheets are stacked in racks to await cutting into whatever sizes may be desired. At cutting tables along one side of the plant a group of skilled men cut the sheets, which are then carefully packed for shipment.

At this plant three general grades of glass are produced. The thinnest of these provides glass for watch-crystals, picture-frames, and many other purposes. Heavier grades of single- and double-strength type are used for windows, mirrors, etc. The heavy-drawn glass serves as safety glass when combined with a filler of transparent plastic sheeting. Under some conditions, the heavy-drawn glass might pass as the more expensive surface-ground and polished plate glass, but at certain angles a waviness is apparent when light is transmitted through it.

A recent development of plastics in the U.S.A., according to the *India-Rubber Journal*, is a plastic bugle. It is claimed that 20 oz. of brass will be saved in each instrument, without loss of resonance. We have no authority for stating, however, that a factory for the production of nylon violin-strings is contemplated as a post-war industrial development.

Some Pointers of Safety Wisdom—I

by JOHN CREEVEY

WISDOM comes by experience; the experience may be our own or that of others. In matters of safety, we share it for the common good; whereas in matters of manufacture we often guard it jealously so that we ourselves may enjoy the whole of the profit. Sometimes details of a device are in question; sometimes merely a statement of facts, which a little more careful thinking on our part would have revealed. Helpful advice reduces the incidence of "accidents"; so does an occasional prod at the management as well as at the individual worker.

An automatic fire escape on the top floor of a high building will enable men to reach ground level safely if the stairway is cut off owing to fire or some other emergency. These automatic escapes are fixed at the end of a steel arm projecting from the wall of the building at window level, and comprise a strong webbing sling at each end of an asbestos-covered wire rope. The rope pulley is controlled by a friction clutch, which allows the rope with its human weight to move at a predetermined speed, and when one man has reached safety the other sling is ready at window level to bring down the next man.

Ladders used by maintenance and repair men often need to rest against pipework. If the ladder slips there is an accident, but it is impossible for this to happen if a satisfactory and simple ladder clip is provided; such a clip fits between the rungs of the ladder and is then hooked over the pipe against which the ladder is to rest.

In situations where there is likely to be dripping of acid, men should wear rubber clothing; acid dripping is common at works using sulphuric acid. The handling of large quantities of sulphuric acid also calls for the provision of a water spray in a really accessible position, with automatic means for releasing a copious shower of water on the victim in the case of an accident. Automatic operation is obtained by a quick-release valve directly operated by the pressure of standing on the floor beneath the spray.

Some processing vessels, normally working at atmospheric pressure, have a tendency to develop slightly increased pressure in the course of the reaction. As a safety measure such vessels should be fitted with an explosion disc, sometimes called a bursting disc. This disc, made of aluminium foil (or some other thin metal made permissible by the process in operation), is provided in a convenient fitment on the shell of the vessel and is there vented to the atmosphere. When pressure increases, the disc ruptures and the excess is released safely.

Manufacturers of gloves for industrial use do not make fifty varieties just for the fun of making them. When a particular job offers hazards to the hands, the right type of glove should be used. Likewise goggles, to be properly effective, must be of a pattern suitable to meet the hazard and convenient to wear. Eye injuries and hand injuries may be equally serious; therefore, where goggles or gloves are called for, their use must be enforced.

The works fire brigade should have its personnel drawn equally from each of the shifts operating; only by attention to this "obvious" detail is it ensured that there will be adequate trained men to deal with an outbreak of fire at any time of the day or night.

When men are doing maintenance or repair work, the electrical switches controlling machinery, and heat or light, on that particular section of the plant, must be "locked" against accidental operation. This is best done by providing a steel plate which fits over the switch casing and completely covers press buttons and knobs; such a plate should be marked distinctly in red letters: "WARNING—MEN WORKING."

The hazard of dangerous dusts is not solved by the mere adoption of an efficient mask for use by the men engaged in dusty situations; means must be installed for safely removing as much of the dust as possible as it is produced, for the health hazard may be accompanied by danger of explosion. The installation of a dust-removal system should be entrusted to experienced hands; if the works managers wish to experiment, they may wisely direct their attention to means for reducing the amount of dust produced.

A speed limit is desirable for vehicles moving through the works; one large industrial concern has fixed this speed limit at six miles per hour, and rail and road traffic level-crossings are controlled by "flag men" and wooden obstructing safety arms. If the number of employees is large, incoming and outgoing road traffic should be suspended while a shift is entering or leaving the works gates.

The danger of accidents at corners is greatly reduced by the use of reflecting mirrors. Mirrors also give the hoist attendant a better view of work at ground level. Likewise, in the case of packing or tableting machinery, a mirror allows the operator to have a view of the rear of the machine, which is sometimes necessary and often desirable from a safety aspect.

Hoisting tackle must be inspected at regular intervals if general safety is to be assured; the inspection should be carried out by a competent member of the works engineering staff and an inspection report should be filed. At ground level there must be prominent and continuous warning of the presence of hoisting tackle overhead; where possible the danger space should be railed off. A red line painted on the floor to follow the track, especially at corners, will help to avoid accidents from an overhead runway equipped with hoisting tackle.

The provision of an electric cut-out on the manhole door of a mixing machine which needs frequent internal cleaning can ensure that there is no motive power for the mixing arms so long as the door remains open; accidental closing of the door can be prevented by some simple device such as a bar hinged to the flange of the manhole seating and allowed to spring across the opening when the door is open.

Cylinders of compressed gas need the use of a proper cradle when they are to be hoisted. Never attempt to move cylinders until the valve-protecting caps have been replaced. For moving cylinders about the works, use a truck with a cradle, or at all events one with a rail at the side to prevent the cylinder from rolling off; two or more cylinders placed on the same truck should be prevented from knocking against each other.

It cannot be too strongly stressed that "automatic" devices which are intended to give warning of dangerous conditions must be inspected at frequent intervals, preferably once every week. Because a device has been installed to relieve the plant operator of doing something by hand or watching something carefully, do not assume that safety is completely assured; because the device is regarded as "automatic" there is all the more need for it to be under observation in the matter of inspection.

To prevent the discharge of static electricity in pumping inflammable liquids, particularly spirit of low flash-point, storage tanks must be permanently earthed, and rail or road transport tanks must be earthed while loading and unloading by a "clip-on" earthing system. The danger of an accumulation of static electricity on belt drives is reduced by keeping the atmosphere of the building distinctly humid.

Buildings where plant handles large quantities of inflammable liquid are safest if illuminated from outside by floodlighting at the windows; even under present-day conditions of black-out this can be done if the floodlighting lamps are "totally enclosed," external to the window.

A continuous "foam" generating plant installed at a central fire station, and connected by steel pipeline to strategic points in the works, is the best means of dealing with an outbreak of fire at oil works; pipes should be connected direct to oil storage tanks, so that foam can be delivered in quantity inside the tank if the need arises.

Acid handling causes a large number of minor accidents; therefore avoid the "bucketing" of acids except where unavoidable, when specially designed buckets should be provided.

For the protection of the hands in general process work, treat them with lanoline, cover with stockinette gloves, and then rubber gloves. When rubber gloves are used without the inner stockinette covering there is a tendency to induce sweating; the stockinette also avoids direct contact between skin and rubber, which is desirable when there is possible harm from chemicals used in the manufacture of the rubber.

SAFETY AWAY FROM WORK

"Prevent Off-the-Job Accidents and Stay on the Job" is the title of a booklet, addressed to the war workers of America, that has just been published by the Association of Casualty and Surety Executives, New York. It is small and concise, and complete enough to convince every American worker that his or her presence on duty every working day is essential to victory. The booklet tersely puts safety on a firm patriotic basis during the war crisis. Pointing out that in 1941 almost twice as many persons were killed or injured away from work as compared with in working hours, the booklet lists the types of accident that cause most of the fatalities and injuries, both on the road and in the house, and offers quick, authoritative suggestions as to how they can be prevented. It is intended for distribution by plant managers, foremen, and safety supervisors as a means of helping them to educate employees in the need of commonsense care after they have left the protections which surround them at their jobs.

Industrial Safety Gleanings

Unusual Accidents : Precautions in Storing Acids

A REGULAR feature of the *Industrial Accident Prevention Bulletin*, issued by the Ministry of Labour and produced by the Royal Society for the Prevention of Accidents, is that headed " Unusual Accidents." In chemical works, especially those where new materials are being dealt with for the first time on a commercial scale, such accidents are more likely to occur than in many other places. Practically no accident is inevitable, but unfortunately they do occur; and the study of unusual accidents that have occurred may aid in keeping them unusual, possibly unique, even though the reader may be convinced that the actual type of accident described could never occur in *his* works.

High Pressure Hazards

Two men had built a fire under a partially filled drum of roofing compound in order to melt it enough to run from a tap, but failed to open a bung or filler hole. Internal pressure built up and split the drum open. Both men were injured—one fatally—when they were sprayed with the hot roofing compound. Serious burning from another cause occurred when a process worker had been unloading a tank wagon of fuel oil with steam circulating in the coils of the car to facilitate unloading. After pumping out the wagon, he shut off the steam and, without allowing time for the pressure to drop, he immediately disconnected the steam hose from the wagon coupling. The steam and condensate, under pressure, shot out of the coils and struck him. This employee was working a relief shift and had little experience of unloading tank wagons. His superior should have made him realise the importance of allowing the pressure to drop in the steam coils before disconnecting the steam hose.

A story from the *New South Wales Industrial Gazette* relates what happened when a worker was engaged in collecting empty four-gallon tins which had contained thinners used for lacquer and synthetic enamels. A particular tin had been emptied some days previously and was to be returned to the manufacturers. In addition to the filler opening of the tin, a small hole had been punched in it. The worker, unaware of the danger, took the tin to another employee, who was then using an oxy-acetylene torch, and requested him to fill up the small hole, assuring the welder that the tin was empty and that it was " all right to use the torch." Thereupon the welder applied the flame to the hole and an explosion occurred. The resultant flame so severely burned the welder that he eventually died.

The importance of goggles cannot be too often insisted on. If men working in a particular department are expected to wear goggles most of the time they are in the building, it is tolerably obvious that any visitor to the department ought also to wear, or at any rate carry, goggles. Included in the term " visitors " is any person who does not habitually work in the department, *e.g.*, the safety officer, the works engineer, directors, the departmental manager, etc. In other words, if there is a rule that goggles must be worn by workers in a particular plant, no one should show his face inside that plant without goggles. This is only fair; moreover the propaganda value of visitors in goggles is incalculable. There is even a case on record in one works of a foreman who turned back the general manager because he had not brought his goggles : as the great man said afterwards, " And quite right too."

To say that good floors prevent caustic burns is apparently inconsequent; yet a firm handling large quantities of caustic soda has recently stated that, apart from enforcing the wearing of goggles, the greatest single contribution to reducing the number of caustic burns has been such careful maintenance of floors that puddles, and consequent splashing, are avoided.

The Storage of Acid

Manufacturers and users of acid should pay particular attention to the series of " Test Questions " included in the *Bulletin* (Vol. 10, No. 113, p. 44) and concerning the storage of acids in carboys, drums, and bottles. In case the *Bulletin* should be unprocurable, we regard these questions as of such importance to the safety of chemical workers that we reprint them here in full.

1. Are all acids, except small quantities required for immediate use in the works, stored in a room set apart for the purpose?

2. Is everything except acid containers excluded from this room, it being understood that the mixed storage of acid and other goods or material might easily lead to fires and the evolution of noxious fumes?

3. Is the room : (a) well ventilated; (b) so placed that no one, even a maintenance man, ever has to enter it except in connection with its use as an acid store; (c) provided with doors that open outwards; (d) isolated from sources of heat such as steam or hot water pipes and the direct rays of the sun?

4. Is the floor of non-slip, impervious material? Can it be hosed in the event of a spill and are the necessary hoses and taps provided? Has it a good level surface so that puddles cannot collect?

5. Is the floor kept free from combustible materials such as straw because of the danger of chemical action?

6. Is entry restricted to authorised persons? If juveniles are at present included among those authorised, is this essential?

7. Is each acid kept in a separate row or tier?

8. Is each container, or for larger quantities each row or tier, conspicuously marked with the name of the acid?

9. Are the bottom rows of each tier supported a few inches above the ground on a platform so that leakages and spills can easily be detected and washed away?

10. Is the lighting good enough for safe handling and instant detection of spills?

11. Is the whole of the electrical installation of a special type designed to resist atmospheric corrosion?

12. Have you a rule, which you enforce rigorously, that not less than two men working together may man-handle a carboy?

13. Are stoppers released on receipt of carboys at the store? at intervals afterwards? and always after any considerable rise in temperature?

14. Is full protective clothing provided, *i.e.*, gloves, goggles, aprons, rubber boots, and, perhaps, proofed woollen oversleeves?

15. Is the use of all this clothing strictly enforced? Do members of the supervisory staff visiting the store make a point of wearing goggles?

16. Have you explained to men authorised to enter the store that, so far as their personal clothing is concerned, wool is preferable to cotton when handling acid?

17. Are eyewash bottles provided and maintained in the store? Have the men been instructed and practised in their use?

18. Is there a shower or a large bath of water in the store for dealing with extensive splashing? Is there a telephone in the store so that the first-aid attendant can be called to a bad case of burning instead of taking the patient outside for treatment?

19. Are safe and suitable trucks provided for moving carboys about the works? Are these trucks provided with cradles or some similar device to prevent carboys falling off?

20. Do you invariably use a carboy tilter or one of the other devices (*i.e.*, a syphon or a compressed-air bell to balance pressure outside and inside the carboy) for removing acid from carboys?

21. If a tilter is used, do you provide a non-splash spout?

22. If smaller vessels are used for acid handling, are they of a non-splash type? Are they kept solely for acids and are they clearly marked "ACID"?

23. If single carboys, bottles and jugs are kept in the shops or process buildings, have they proper places in which to be kept, safe from mechanical damage?

24. Are empty carboys washed immediately their contents have been removed in order to protect persons who may be handling them later?

25. Is there an established routine for ensuring that this washing is carried out and do you make use of the added precaution of labelling such carboys "EMPTY AND WASHED"? Does the person who puts the label on sign it?

Swedish Chemical Progress

Fuel Research : Rubber Substitutes

AMONG items of interest announced by Professor E. Velander, Director of the Swedish Academy for Engineering Research, at that Institution's annual meeting, was the prospective foundation of a Fuel Technology Research Station, a project of special importance to-day, when Sweden has to rely for fuel mainly on her own forest products. Recent investigations have shown that by mechanical drying of peat up to a temperature of 250° C., or just below the carbonising heat, a hard fuel can be obtained giving much higher efficiency as producer-gas fuel than ordinary wood. Professor Velander also stated that Sweden's domestic production of aluminium now exceeded the peace-time consumption rate. Substitutes for steel in certain applications were being found in special kinds of porcelain, while synthetic fibres with exceptionally long carbon chains in the molecule were being obtained with tensile properties approximating to those of steel.

Efforts to produce synthetic rubber are being continued; under the guidance of Professor Th. Svedberg, of the Physico-Chemical Institute of Upsala, encouraging results have been obtained. A polysulphide has been produced on a trial scale by the Mo-Domsjö pulp concern from purely native raw materials, and will probably be available on a commercial scale at the beginning of next year under the name "Modotiol A." This is a strongly sulphurous, plastic, but also slightly resilient substance which in some cases can replace rubber. A young scientist at the Wenner-Gren Institute has recently produced a substance akin to Thiokol, based on lignosulphonic acids in sulphite lye. Preliminary results of the trial cultivation of foreign rubber-containing dandelions (presumably *kok-saghyz*) are encouraging, but a search of the Swedish flora for rubber-yielding plants has given discouraging results. The main technical data for the erection of factories for the production of fodder yeast from sulphite lye have been prepared, and production will be started at the Svartvik sulphite mills this winter.

Personal Notes

MR. JOHN WILLIAM RAINE, B.Sc., of Leeds, has been appointed works chemist at Darlington gas undertaking.

MR. C. W. ARGENT, secretary and general manager of The Val de Travers Asphalte Paving Company, Ltd., has been appointed managing director of the company and its subsidiaries.

DR. DAVID RANDALL PYE, Director of Scientific Research at the Ministry of Aircraft Production, has been appointed by the Senate of London University to the post of Provost of University College, London, vacant through the death of Sir Allen Mawer.

Obituary

MR. JAMES CLELAND, who was a director of Watson, Laidlaw and Co., Ltd., chemical engineers, died in Glasgow on November 16.

MR. CHARLES HERBERT SANDERSON, who died on November 3 at Hessle, aged 76, was a director of A. Sanderson and Co., Ltd., Kingston Colour, Paint and Varnish Works, Hull.

MONSIEUR EUGENE SCHNEIDER, for 44 years head of the Schneider armament works at Le Creusot, died in Paris on November 17, aged 74, according to Radio Vichy. He was not merely famous as an industrial magnate, but was also distinguished in metallurgical research and practice, and was president of the Iron and Steel Institute in 1917.

New Control Orders

Export of Drugs and Paints

Under the Export of Goods (Control) (No. 42) Order, 1942 (S. R. & O. 1942, No. 2289), which comes into force on December 1, licences will be required to export the following additional classes of drugs, etc., to all destinations: acriflavine, 2-aminopyridine, amyl salicylate, areca nuts, calabar beans, calcium acetyl salicylate, camphor monobromide, carrageen moss, chloral hydrate, chloroform, colocynth, 4 : 4′ diamidinodiphenoxypentane, 4 : 4′ diamidinodiphenoxypropane, 4 : 4′ diaminostilbene, diodone, diphenan, euflavine, hamamelis leaves, ispaghula, jaborandi leaves, jalap resin and root, lobeline, papaverine, phenothiazine, proflavine, psyllium seeds, quassia, salol, santonica, silver nucleinate, silver proteinate, sodium campho-sulphonate, storax, strophanthin, tannic acid, and valerian.

Licences will also be required to export, to all destinations, all distempers, lacquers, varnishes, paints, paste paints (including metallic pastes) and painters' enamels, prepared or ready mixed.

In addition licences will, in future, be required to export, to all destinations, barbituric acid, its derivatives, their salts and preparations; chenopodium oil and its preparations; chaulmoogra oil and its preparations; and hydnocarpus oil and its preparations.

Jute Bags

The Control of Jute Bags (No. 1) Order, 1942 (S. R. & O. 1942, No. 2325; price 2d.) lists the classes of goods that may be delivered in used jute bags, and imposes restrictions on disposals and acquisitions. Collectors, dealers and repairers are free to supply bags to persons who require them to pack permitted goods. Any one is free to acquire, from a person to whom he delivers permitted goods, bags of types similar to those he has supplied and which have contained a similar type of goods. Otherwise people who empty bags must dispose of their empty bags to regular collectors, dealers and repairers. Returns are required every three months by the Jute Control, 1 Victoria Road, Dundee, from: (a) users who during the twelve months ended June 30, 1942, used more than 5000 used jute bags for packing permitted goods (on their own paper); and (b) collectors, dealers and repairers who, during the same twelve months, sold more than 10,000 used jute bags (on forms supplied by the Control).

Chalk and Lime

Under the Control of Whiting, Chalk, and Chalk Lime Order, 1942 (S. R. & O. 1942, No. 2296), which came into force on November 16, no person shall produce, acquire, or dispose of any whiting (lump or powdered), chalk (whether ground or not), or chalk lime (whether hydrated or not) except under a licence granted by the Minister of Works and Planning.

Institute of Fuel

Midland Section Formed

A MIDLAND section of the Institute of Fuel was formed at Birmingham on Saturday last, when Dr. C. M. Walter, head of the scientific research branch of the Birmingham Gas Department, was appointed chairman. The hon. secretaries are Messrs. A. F. Webber and C. F. Wade. Dr. Walter, in an address, insisted that close liaison was necessary between engineers, industrial chemists, and fuel technologists with the object of further improving efficiency in the use of fuels in industry. Only such a body as the Institute of Fuel could bring about the contact necessary for fuel problems to be tackled efficiently. Dr. E. W. Smith, director-general of gas supply, Ministry of Fuel and Power, spoke of progress in industry of the battle for fuel, and expressed the view, from outside judgment, that the battle had gone very well.

General News

From Week to Week

The business of T. R. Bonnyman, Son & Co., chemical manufacturers, Glasgow, is now being carried on under the supervision of the executrix of the late J. S. Bonnyman.

Two and a half million tons of scrap metal have already been collected in this country, said Sir James Marchant, Director of Salvage, speaking at Manchester.

Under an agreement the United States and Great Britain are to be the exclusive purchasers of all oils and fats available in North and South America, including the West Indies, with the exception of animal fats in Argentina and Uruguay, which will be sold exclusively to Great Britain.

"Fire" is the title of a leaflet just published by John Bale and Staples, Ltd. (3d.), and compiled by A. E. Johnson. It is a complete guide on correct behaviour during fire bomb raids, and should be studied by all who are not yet familiar with the art of fire fighting.

Alderman H. J. Sayer, chairman of the Tame and Rea District Drainage Board, Birmingham, stated at the annual meeting on Friday last week, that by utilising waste-product gas from sewage sludge for generating electricity the Board saved 4000 tons of coal last year.

Following the announcement by Scottish firms that they are encouraging a movement for the amendment or annulment of the Ministry of Supply Order for a concentration of the paint industry, Yorkshire manufacturers state that they are looking to the support of local Members of Parliament in their own opposition to the scheme.

During a recent visit to South Wales, Lord McGowan, chairman of Imperial Chemical Industries, Ltd., said: "When we have finished the job of winning the war, we shall certainly be giving very earnest consideration to the conversion of our plant to peace-time needs. Never again must any industrial area be allowed to become derelict."

Allegations that a so-called "combine" of china-clay companies had conspired with Government officials to the detriment of the plaintiffs were made by South Fraddon China Clays, Ltd., in an action which was begun in the High Court before Mr. Justice Cassels last Monday. It was further alleged that the Board of Trade had been unfairly induced to make the Production and Supply of China Clay (Restriction) Order, 1942 (*see* THE CHEMICAL AGE, March 21, 1942), and had also been induced to withdraw a licence which had been granted to the plaintiffs under the above Order. The defendants denied all the allegations.

The Minister of Food has made an Order amending the Soft Drinks (Licensing and Control) Order, 1942, so as to require all manufacturers and packers of soft drinks to be licensed, irrespective of the size of their output, as from December 7. Licences which have already been issued will not be affected.

Next to a book on his own subject, the most interesting thing to a thinking man is a catalogue of such books. W. & G. Foyle, Ltd., Charing Cross Road, London, have issued a list of technical books, which covers more than 450 subjects, and runs to over 100 pages. The published prices are set out clearly and, in an adjacent column, second hand prices are given of those books which are in stock.

Foreign News

For 1943 America plans a synthetic rubber output of 11 per cent. of their former crude rubber consumption.

The use of peat gas for iron smelting has been tried in Switzerland, and pig iron of a satisfactory quality was, it is claimed, obtained. Both iron ore and peat are available from local sources.

Spanish turpentine and colophony, in face of the difficulty of export, are to be used for the manufacture of celluloid, synthetic camphor, fuel substitutes, and synthetic caoutchouc in the country.

Sociedad Iberia Nitrogeno, the Spanish company which is building an ammonium sulphate plant at La Felguera, will produce 130 tons of oleum per day for its own use. Montecatini patents will be used, the machinery being supplied by Italy.

W. P. B., Washington, announce that twenty-four million pounds of copper have already been saved by the substitution of silver for copper in electrical conductors in plants where electrical connections are a significant feature of production.

A new company, Standard-Kuhlmann, Paris, with a capital of 5,000,000 francs has been formed by Kuhlmann, Standard Française des Pétroles, Société Immobilière Chimique, and Société Commerciale pour Agriculture et Industrie, for the production of chemical products, including in particular fuels, lubricants and substitute fuels.

Increased production of lead at the Mines d'Aouli, French Morocco, is another sign of the transfer of industry from France to her North African possessions. Moroccan mines which were closed in 1940, owing to lack of labour and chemicals, are now in operation and an annual output of 5400-6000 tons is expected (8350 in 1940).

The President of Peru has announced that, in addition to the old Santa Barbara mines, mercury deposits in the Department of Puno are being studied. If results are favourable the deposits will be exploited either by the Government or by a Government-financed company.

Pyrites from Spanish sources will be the raw material basis of the plant which Sociedad Española de Construcción Electromecánica intends to build. It is hoped to produce 5000 tons of copper, 50,000 tons of sulphur and 15,000 tons of sulphuric acid per annum.

Cryolite has come under complete Government control in the U.S.A., and, since October 1, it may not be delivered, received, or used without specific authorisation of the W.P.B., except as an insecticide. The same restriction and exception apply to copper chemicals.

An Office of Technical Development is being organised by the War Production Board, Washington, D.C., to study and investigate inventions and other scientific information useful in the war programme. It is stated that the new office will be headed by Col. Royal B. Lord, assistant chief of the Board of Economic Warfare.

Canadian zinc deposits, discovered near the Labrador border and believed to be of considerable importance, are reported through official sources. A zinc refinery is said to be under consideration, aided by a government subsidy. The short open season and lack of transport facilities are cited as obstacles.

The Plastic War Production Association, with headquarters at 122 East 42nd Street, New York, will pool the engineering, research, and manufacturing facilities of companies in the New York area for the benefit of Government war contracts, and will endeavour to develop new applications of plastics to conserve vital metals.

Nickel production at Petsamo, Finland, which was about to begin when the Finnish-Russian war broke out, is reported by *Metallwirtschaft* to have started since. The mines, which suffered heavy damage during the war, were restored with the help of German engineers and material. Preparations for the mining of nickel ore are said to be in hand at Nivala in central Finland.

An American Industries Salvage Committee, representing groups of leading industrial concerns, was formed recently to help in speeding the collection of vital scrap materials. The committee hopes to reach every manufacturing and business firm in the nation and impress upon them the absolute necessity of getting their scrap on the way to the production line, and to get business men to co-operate with the local salvage committees.

Exports of vegetable oils from the Argentine in the first seven months of 1942 totalled 67,337 metric tons, according to the Bank of London and South America, against 47,864 tons in the whole of 1941 and 7348 in 1940. A similar expansion might be looked for in the case of Brazil, except that lack of transport and labour hampers production and Brazilian oils still await standardisation.

Dyes made directly from soft coal, instead of from coal tar, have been described by Dr. H. B. Charmbury, of Pennsylvania State College. The coal is first treated with nitric acid to obtain a foundation material, which is then treated with organic acids and inorganic alkalis to produce the dyes themselves. Dyes so obtained were successfully tried by Dr. Charmbury on animal, vegetable and synthetic fibres.

Methanol from methane may be produced in Italy by the new catalytic process of C. Padovani and A. Lotteri. Approximately 2½ lb. of methanol can be produced from one cubic metre of methane, but it is doubtful whether the process is economic at present, as available supplies of methane do not seem to be large enough and movement of the plant from one place to another may be necessary.

Production of a new synthetic textile filament is announced by the Celanese Corporation of America. The fibre, according to New York Press reports, has been given the name "Fortisan" and "has a diameter of approximately 1/10,000 inch," thus claiming to be "the finest filament produced by man or nature." The Corporation's entire output has been earmarked for war purposes where silk has hitherto been employed.

Experiments in the extraction of rubber substitute from the Natal euphorbia tree (*Euphorbia tirucalli*) are proceeding apace in South Africa, and it is forecast that production may begin in about 18 months and should amount to several hundred tons a year. A method has been evolved of extracting the sap without harming the tree, and the rubber-like extract can now be cleared of excess resins. Even without complete resin extraction, it is stated, euphorbia rubber can be used in quite high proportion in a number of products.

The Dutch oil mills were operated on a limited scale only in 1941, and the margarine and fat factory was almost closed down during the second half of the year, according to the report for the year of Van den Berghs en Jurgens Fabriken. Several new products have been taken up, but while imports of oilseeds from overseas have been stopped, the supply of chemicals has also declined. The curtailment of soap consumption has greatly increased the demand for cleansing materials. Similar difficulties have been experienced by the group in other Continental countries.

Forthcoming Events

A Cantor lecture of the **Royal Society of Arts** will be held at John Adam Street, Adelphi, W.C.2, at 1.45 p.m., on **November 23,** when Mr. A. C. Pallot, M.B.E., will speak on "Thermal Insulation at Medium Temperatures."

A meeting of the Midlands Section of the **Society of Glass Technology** will take place at 7.30 p.m., on **November 23,** at the Talbot Hotel, Stourbridge. Professor W. E. S. Turner will give an address on "Glasses for War-Time Purposes."

"Bread" is to be the title of the first of a series of lectures on "The History of our More Important Foods," to be delivered to the **Royal Institution** by Professor J. C. Drummond, D.Sc., F.I.C. There will be four lectures in all, and they will take place at the Royal Institution, Albemarle Street, W.1, at 3 p.m., every Tuesday, starting **November 24.**

A meeting of the **Institute of Fuel** will be held in the Connaught Rooms, Great Queen Street, W.2, at 2.30 p.m., on **November 26,** when Dr. D. H. Bangham and Dr. G. C. Phillpotts will present a paper on "The Standardisation of the Critical Air Blast Test."

The Scottish Section of the **Society of Dyers and Colourists** will meet at the St. Enoch Hotel, Glasgow, at 6.30 p.m., on **November 27,** to hear Mr. J. M. Preston, M.Sc., A.I.C., F.R.M.S., speak on "A New Method of Visual Observation in the Infra-Red, and its Application to Dyes."

The next meeting of the **Electrodepositors' Technical Society** will take place at 4 p.m., on **November 30,** at the Northampton Polytechnic, St. John Street, E.C.1, when there will be a discussion on "Acid Economy in Plating Processes."

A meeting of the **Institution of Civil Engineers** will be held at Great George Street, Westminster, S.W.1, at 2 p.m., on **December 1,** when a paper on "Hydro-Electric Development: Some Economic Aspects," will be presented by Messrs. J. K. Hunter, B.Sc., and R. W. Mountain, B.Sc.

The second of the Royal Institution's lectures on "The History of our More Important Foods," by Professor J. C. Drummond, D.Sc., F.I.C., is entitled "Meats." It will take place at the **Royal Institution,** Albemarle Street, W.1, at 3 p.m., on **December 1.**

A meeting of the Bristol section of the **Society of Chemical Industry,** jointly with the **Institution of Chemical Engineers,** will be held at the Chemistry Department of the University, Woodlands Road, Bristol, at 5.30 p.m., on **December 3.** Mr. A. H. Manning will speak on "The Production of Nitric Acid."

The **Association of Scientific Workers** is holding a Conference on "Scientists of the United Nations and the War Effort," at Gas Industry House, Grosvenor Place, S.W.1, on **December 5** (2.30 p.m.) **and 6** (11 a.m.). Under the chairmanship of Sir Richard Gregory, F.R.S., Sir John Russell, F.R.S., and Professor John Marrack, D.S.O., M.C., prominent scientists from more than 15 countries will give addresses on the destruction and distortion of science in the oppressed countries, and will show by contrast the contribution of scientists of the United Nations, gathered in this country, to the war effort. Applications for invitations should be sent to the Secretary, Foreign Scientists' Committee, Association of Scientific Workers, Hanover House, 73 High Holborn, W.C.1.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Notice of Dividend

ROSS, JAMES WALTER EDWARD, Park Langley, near Beckenham, Kent, hydrological chemist. Dividend, 8s. 9d. per £, payable November 17, Official Receiver's Offices, 29 Russell Square, London, W.C.1.

Receivership

LACCO PROPRIETORS, LTD. (R., 21/11/42.) K. A. Jones, 103 Cannon Street, E.C., appointed receiver and manager on November 7, under powers contained in series of debentures dated April 11, 1938.

Company Winding-up Voluntarily

DAVIDSON RETORTS (BRITISH RIGHTS), LTD. (in liquidation). (C.W.U.V., 21/11/42.) By extraordinary resolution November 5, W. B. Anderson, liquidator.

Company News

Reckitt and Sons, Ltd., have declared an interim dividend of 5 per cent. (same).

E. I. Du Pont de Nemours have declared a final dividend of $1, making a total this year of $4.25, compared with $7 last year.

The International Nickel Company of Canada earned a net profit of $8,368,510 in the three months to September last ($8,380,331).

Tube Investments, Ltd., have announced a final dividend of 10 per cent., making 20 per cent. for the year ended October 31 (same).

Lawes Chemical Co., Ltd., announce a trading profit, for the year ended June 30, of £33,925 (£27,409), and a dividend on the ordinary shares of 6 per cent. (same).

Wm. Neill and Son, industrial, chemical, and structural engineers, are considering an increase of capital. Taxation, they say, has prevented consolidation of the liquid position from retained profits.

Kolok Manufacturing Co., Ltd., has announced a trading profit for the year ended August 31, of £50,440 (£39,059), and a final dividend of 80 per cent. on the deferred stock, making 120 per cent. for the year (same).

New Companies Registered

Oldley Chemicals, Ltd. (376,987).—Private company. Capital: £1000 in 1000 shares of £1 each. Manufacturing chemists, druggists, drysalters and oil and colourmen, etc. Subscribers: L. W. Matthews; A. E. Connon. Registered office: 2 Redway Drive, Whitton, Middlesex.

Shearman and Co., Ltd. (377,168).—Private company. Capital: £1000 in 1000 shares of £1 each. To acquire the business of chemical and mineral merchants carried on by H. C. Shearman and Margrete D. Shearman at 2 Bedford Place, Tavistock, as "Shearman and Co." Directors: H. C. Shearman and Margrete D. Shearman.

Chemical Accessories, Ltd. (377,179).—Private company. Capital: £2500 in 10,000 shares of 5s. each. Manufacturers, importers and exporters of and dealers in chemical products, salts, acids, alkalis, drugs, etc. Subscribers: G. W. Roberts, J. Cooper. Registered office: 82 King William Street, E.C.4.

Miraculin, Ltd. (377,093).—Private company. Capital: £100 in 100 shares of £1 each. Manufacturing, wholesale, retail, consulting, and analytical chemists. Directors: H. W. K. Pears, K. von der Heyde. Registered office: Hove Park Laboratories, Hove, 4, Sussex.

Chemical Manufacturing Laboratory Ltd. (377,142). — Private company. Capital: £3000 in 3000 shares of £1 each. To acquire the business of chemical manufacturers carried on by H. C. Shearman and Margrete D. Shearman at 2 Bedford Place, Tavistock, as the "Chemical Manufacturing Laboratory." Directors: H. C. Shearman and Margrete D. Shearman.

Macdonald and Co. (Coventry), Ltd. (377,215). — Private company. Capital: £500 in 500 shares of £1 each. Manufacturing, wholesale and analytical chemists, chemical manufacturers, etc. Directors: Mrs. M. I. McDonald Liegeois and H. L. McDonald Liegeois, F.C.S. Registered office: 21 Broomfield Place, Spon End, Coventry.

Chemical and Allied Stocks and Shares

REACTIONARY conditions have ruled in Stock Exchange markets, due more to falling-off in demand than to selling, profit-taking sales having been relatively moderate, despite the large gains made in industrial and allied securities earlier in the month. The less active conditions arose partly from the widespread disposition to await progress of the important war developments in North Africa. There appeared to be relatively little profit-taking in securities of companies associated with the chemical and allied industries, and consequently it would seem that much of the recent demand was on the part of investors prepared to regard the shares in the nature of permanent holdings.

Borax Consolidated deferred have been firm at 35s., the market view being that there appear reasonable prospects of a continuance of the dividend at 7½ per cent. Turner & Newall at 75s. 9d. were little changed on balance, the disposition being to await the financial results, due in a few weeks. British Aluminium eased slightly from 50s. 3d. to 49s. 9d., while at the time of writing British Oxygen have remained at 74s. 6d. Imperial Smelting have been steady at 15s. 3d., pending the dividend announcement. Imperial Chemical at 36s. 6d. were within 3d. of the level current a week ago. The market is not looking for any improvement in the dividend on the last-named, owing to the effect of E.P.T., but it is realised that on the basis of last year's 8 per cent. payment, the yield at the current price compares favourably with the return on numerous other leading industrial shares. Tube Investments were steady at 89s. 9d., the dividend being in accordance with general expectations, while Stewarts & Lloyds deferred units were firm at 49s. 6d. Results of the last-named company fall to be issued next month.

The units of the Distillers Co. reacted from 84s. 9d. to 83s., but at 29s. 3d. United Molasses were unchanged on balance. Lever and Unilever were favoured, and were 32s. as compared with 31s. 3d. a week ago, sentiment having been responsive to the view that, although during the war period a very conservative financial policy is likely to continue to be followed, there may be good scope for recovery in dividend payments after the war. At 34s. 6d. Dunlop Rubber were within 6d. of the level current a week ago, while elsewhere Amalgamated Metal shares further improved to 17s. 6d., although Allied Ironfounders had a less firm appearance at 37s. 9d. At 47s. 9d. Babcock & Wilcox recovered part of an earlier reaction, while Thomas Firth & John Brown shares were marked up 1s. 3d. to 66s. 10½d.

Textile issues were slightly lower, where changed, including Bradford Dyers ordinary and preference at 15s. 3d. and 17s. 9d. respectively. Exceptionally, British Celanese were firmer on consideration of the revised plan for funding the dividend arrears on the second preference shares. Elsewhere, Barry & Staines at 36s. were within 3d. of the price ruling a week ago, while

Nairn & Greenwich remained firmly held at 57s. 6d. There was again a fair amount of activity in shares of companies identified with plastics, but quotations were affected by the easier trend on the Stock Exchange. British Industrial Plastics were slightly lower at 4s. 6d. as were Lacrinoid Products at 4s. 1½d. Catalin ordinary have transferred around 3s.

In other directions, W. J. Bush shares remained very firmly held and were quoted at 50s. British Drug Houses were maintained at 20s., and Goodlass Wall 10s. ordinary were 12s. 6d., while at 17s. 3d. Cellon 5s. ordinary showed an improvement of 3d. as compared with a week ago. Burt Boulton were 15s. and British Glues & Chemicals 4s. shares were quoted at 6s. 6d. Business at 8s. 6d. was recorded in British Tar Products 5s. shares. Gas Light & Coke ordinary recorded further improvement to 17s. 9d. Oil shares showed a fair amount of activity, but were inclined to fluctuate, the recent rise having attracted profit-taking sales.

British Chemical Prices

Market Reports

TRADE in general chemicals continues along fairly steady lines and a strong tone is displayed in several sections of the market. A moderate volume of new inquiry is in circulation and deliveries against existing contracts are well maintained. The price position generally remains steady and current market quotations continue as at recent levels. In regard to the soda products, chlorate of soda is an active item and a good inquiry is reported for bichromate and nitrate of soda. The position of the potash compounds, so far as supplies are concerned, shows no material alteration and offers of all descriptions are quickly absorbed. There is a brisk demand for oxalic and acetic acids, and both tartaric and citric acids are in steady request at recent values. In the coal-tar products market a ready outlet is reported for both creosote oil and carbolic acid, while a fair inquiry is in circulation for pitch.

MANCHESTER.—Business in heavy chemicals on the Manchester market during the past week has proceeded on much the same lines as of late. Fresh inquiry and actual new bookings have been on a moderate scale and chiefly for home consumption, while in the general run of soda products, the ammonia and magnesium compounds, and in most of the acids there has been a generally good call for deliveries against running contracts. Prices in all cases are very firm. In the tar products market, there is a fair trade in pitch, a moderate inquiry for pyridine, and a steady demand in other directions.

GLASGOW.—In the Scottish heavy chemical trade there is no change during the past week. Home business maintains its steady day-to-day transactions, while export trade is rather restricted. Prices remain very firm.

APPOINTMENTS VACANT

None of the advertisements below relates to a woman between 18 and 31 unless such a woman (a) has living with her a child of hers under the age of 14, or (b) is registered under the Blind Persons Acts, or (c) has a Ministry of Labour permit to allow her to obtain employment by individual effort.

QUALIFIED Chemist required for large firm of cable manufacturers, within the London area. Sound knowledge and experience of plastics as applied to high grade insulating materials essential. Details of training, qualification, experience and salary required to Box No. 2089, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

WANTED, Metallurgical Chemist with good experience on extraction of Vanadium oxide from ores, etc. Good permanent position as Departmental Manager in small Birmingham works. Chemical initiative to adapt processes essential. Full details in confidence to Box No. 2091, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

EDUCATIONAL

THE INSTITUTION OF CHEMICAL ENGINEERS.

EXAMINATION, 1943.

APPLICATION forms (returnable 21st December, 1942) and particulars of the Associate-Membership Examination for 1943, together with the Memorandum on "The Training of a Chemical Engineer," may be obtained from the Hon. Registrar, Institution of Chemical Engineers, 56 Victoria Street, Westminster, London, S.W.1.

WANTED

WERNER type Tilting Mixing Machine, with "Z" arms, and of heavy construction, preferably double geared: Pan approx. 30 in. by 30 in. by 28 in.: This machine is urgently required for very essential work. Please reply to Box No. 2090, THE CHEMICAL AGE, 154 Fleet Street, E.C.4.

Secondhand
LEAD LINED TANKS
for sale

OPEN Top Lead Lined Timber STORAGE VAT, 13 ft. by 5 ft. 6 in. by 6 ft. deep; lined with 3/16 in. thick lead; with angle iron strengthened bars.

FIVE—Homogeneously Lead Lined Mild Steel TANKS by John Thompson; 13 ft. 10 in. long by 5 ft. 10 in. wide by 2 ft. deep; constructed from ⅜ in. mild steel plate; lined with ¼ in. thick homogeneous lead; 5 in. dia. bottom run-off.

Mild Steel Lead Lined TANK or ACID WEIGH TANK, 12 ft. long by 3 ft. 6 in. wide by 3 ft. deep; constructed from ¼ in. mild steel plates suitably stiffened with rolled steel angles; lined with 10-lbs. lead; with slightly concave bottom; five 5 in. dia. bottom run-off.

Timber Lead Lined TANK, 9 ft. 10 in. long by 4 ft. 10 in. wide by 3 ft. 6 in. deep inside; constructed from 3 in. thick timbers and stayed with mild steel bars; lined with about 8-lbs. lead; with bottom run-off.

Timber Lead Lined TANK, 7 ft. long by 4 ft. 9 in. wide by 3 ft. 3 in. deep; constructed from 3 in. thick timbers and stayed with mild steel bars; lined with 10/12-lbs. lead; 1½ in. bottom run-off.

Mild Steel Lead Lined TANK, 7 ft. long by 3 ft. 9 in. wide by 3 ft. 6 in. deep; constructed from welded mild steel plates and lined with ¼ in. thick lead; with inlet and outlet connections at one end.

GEORGE COHEN, SONS & CO., LTD.,
WOOD LANE, LONDON, W.12,
and STANNINGLEY, near LEEDS.

'Phone 38 Staines.

OVAL Jacketted Vacuum Oven, 7 ft. by 6 ft. by 3 ft. 6 in.; 40 gallon Copper Jacketted Pan; 30 in. Belt Driven Hydro; Steam Retort, 7 ft. by 2 ft. 9 in.; 50 gallon Jacketted (Gun Metal) Pan.

HARRY H. GARDAM & CO., LTD.,
STAINES.

100 REBUILT Hydro Extractors by all leading makers from 18 in. upwards with countershafts attached and safety covers. Jacketed Steam Pans, various sizes. List on request. Seen at Randalls, Arundel Terrace, Barnes. Telephone: Riverside 2436.

CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone: 3285 East.

FOR SALE

We told you . . . . . .

IN those first days of war, we began our Campaign of warning our friends to see to chimney needs. We said prices would rocket beyond belief . . . . were we wrong? And those who followed our advice . . . . didn't you save money? To-day the problem takes a grimmer twist. It's not price now. It's MATERIAL . . . AND LABOUR. Please don't delay, but plan ahead. Things are difficult now, but in a year's time, conditions to-day will seem a picnic. If you can't lay out money NOW, talk to us about it. Maybe we can help.

ESERIN (STEEPLEJACKS), LTD.,
7 Gt. Castle Street, W.1.
Langham: 2914.

HYDRAULIC TUBING, 1 in., large quantity, secondhand, new condition, also limited quantities other sizes and fittings. Hydraulic Valves, new, various types against requirements. Thompson & Son (Millwall), Ltd., Cuba Street, Millwall, London, E.14. East 1844.

1000 STRONG NEW WATERPROOF APRONS. To-day's value 5s. each. Clearing at 30s. dozen. Also large quantity Filter Cloths, cheap. Wilsons, Springfield Mills, Preston, Lancs Phone 2198.

SERVICING

GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone: 3285 East.

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers' Valuers and Fire Loss Assessors of
CHEMICAL WORKS, PLANT AND MACHINERY,
York House, 12 York Street, Manchester.

Telephone: 1937 (2 lines) Central, Manchester.
Telegrams: "Russoken," Manchester.

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